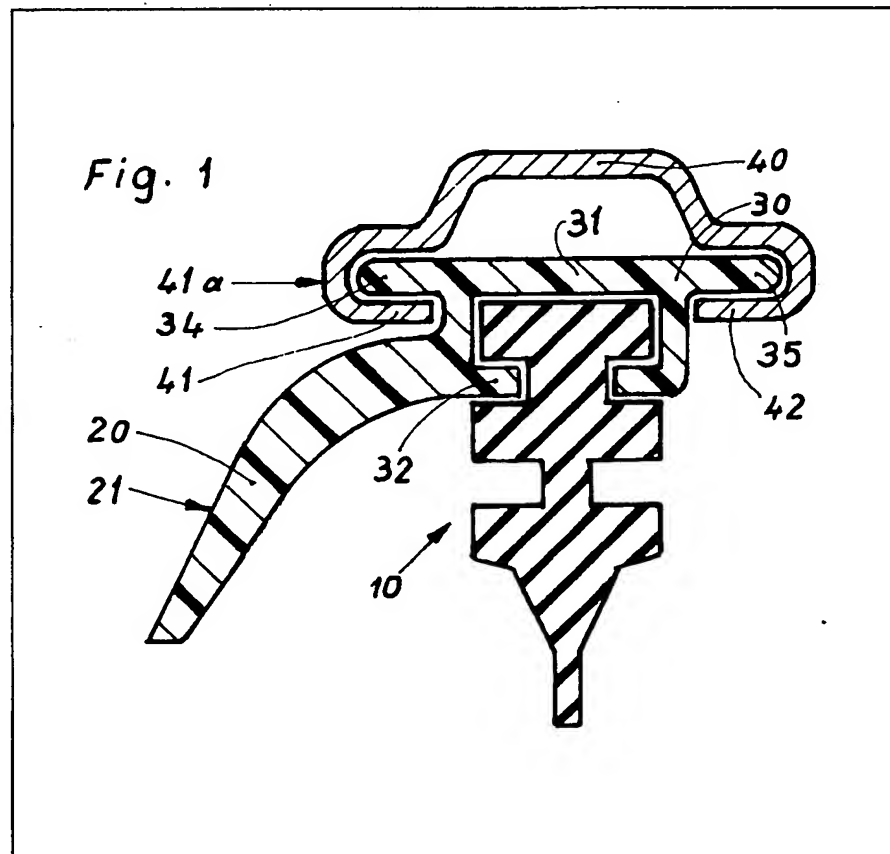


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(54) Wiper blade assembly comprising spoiler

(57) A windscreen wiper blade assembly comprises at least one yoke element 40 for holding a wiper element 10 of rubber-elastic material, which is flexibly stiffened by means of a flexible strip 30 provided with at least one spoiler 20 which is either formed thereon or attached thereto.



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Fig. 1

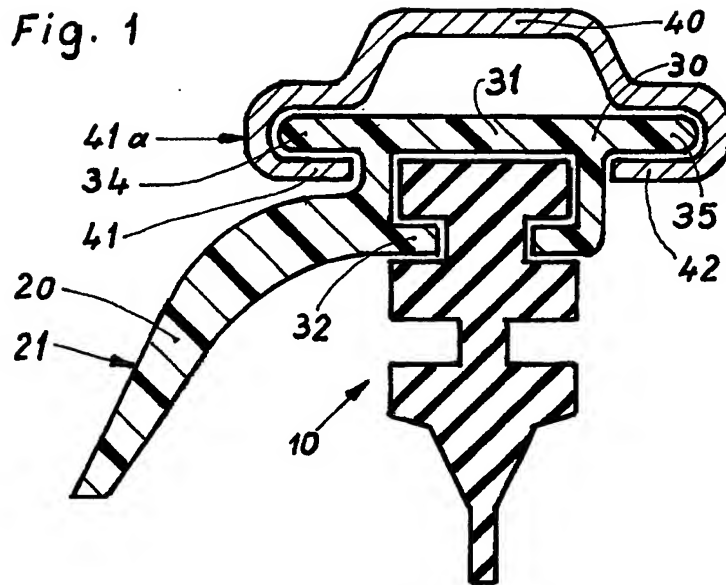


Fig. 2

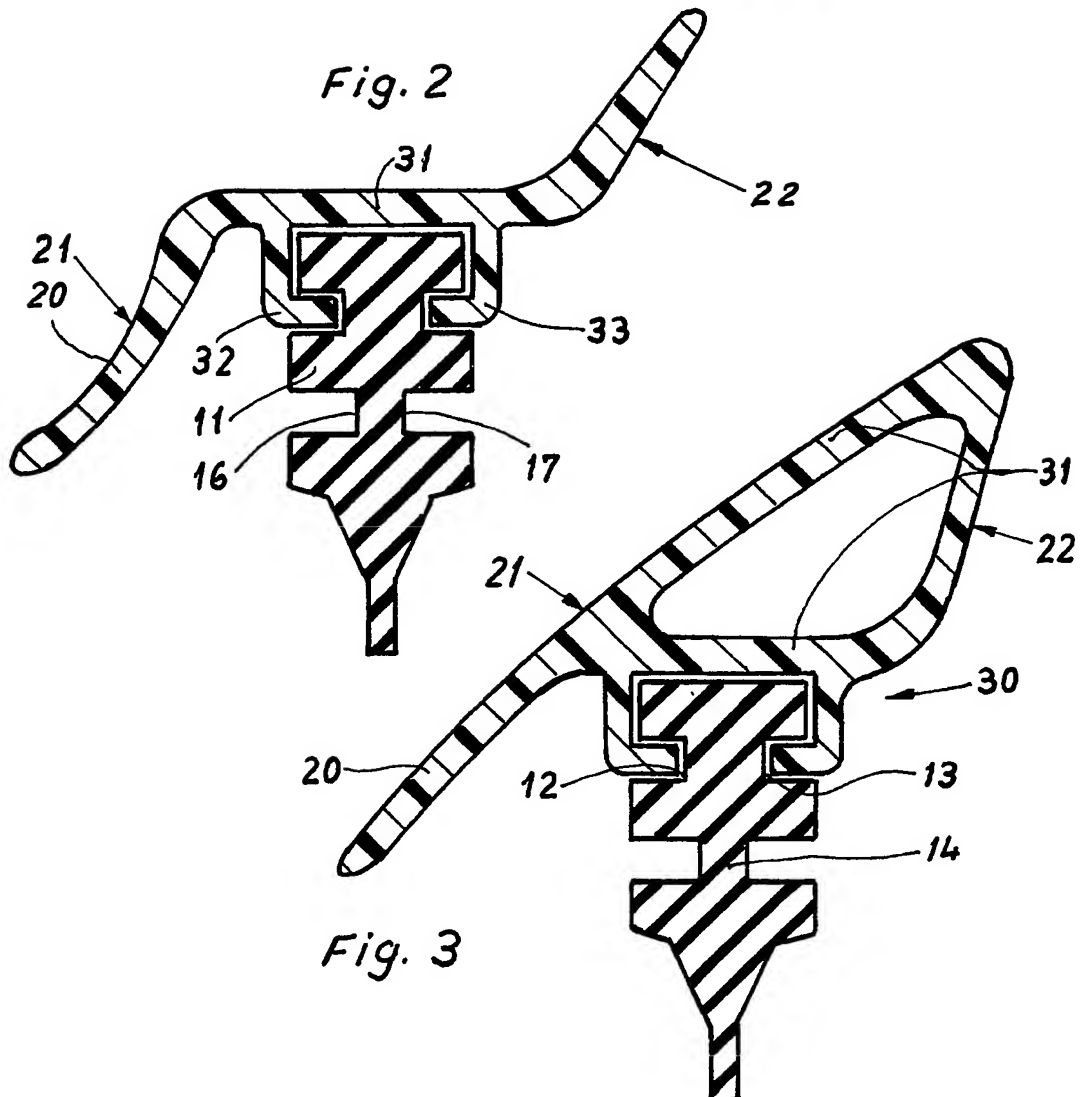


Fig. 4

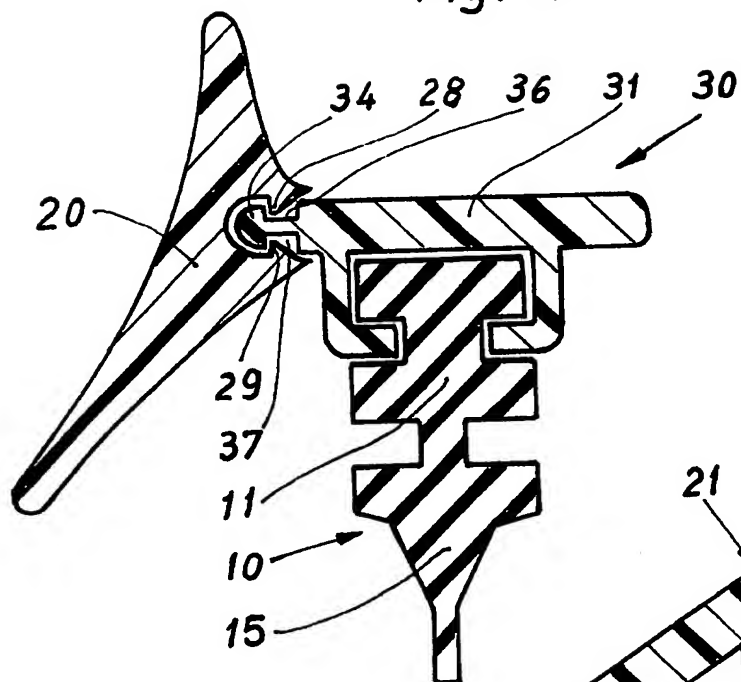


Fig. 6

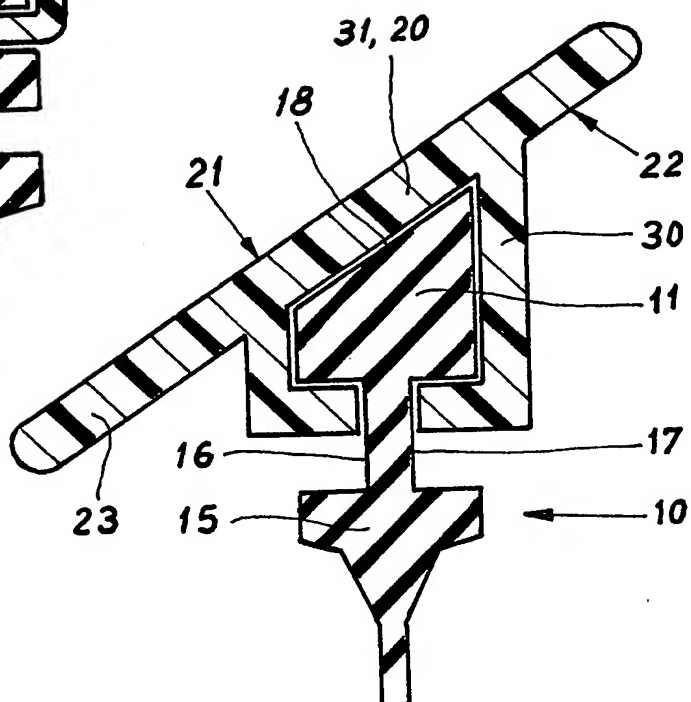
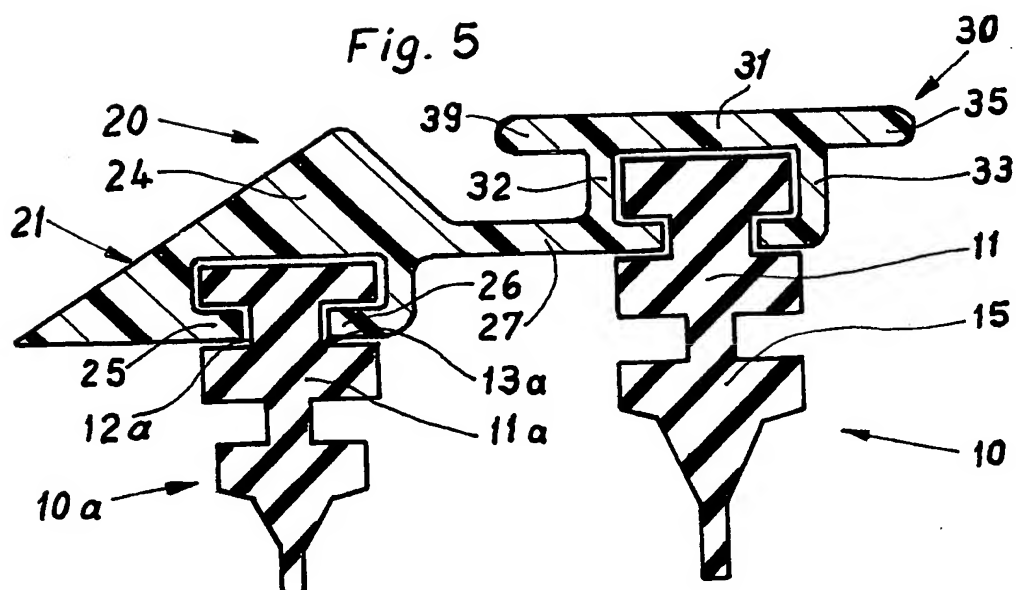


Fig. 5



## SPECIFICATION

### Windscreen wiper installation

5 This invention concerns a wiper blade for wind-  
screen cleaning installations on vehicles, especially  
on motor vehicles.

As is known the air stream striking the wiper blade  
laterally produces a lifting force at the supporting  
10 structure and at the wiper element which is effective  
in a direction away from the pane to be cleaned.  
Thus the contact pressure of the wiper element on  
the pane is diminished, so that the wiping pattern  
deteriorates and the wiper blade may be lifted at  
15 high vehicle speeds. This is not admissible on  
grounds of security.

Many efforts to solve this problem have become  
known, although no entirely satisfactory solutions  
have been found. The practice shows that spoilers  
20 closely arranged to the windscreen are most effective  
against the attacking air stream. Such an  
arrangement is for example known from the German  
sopecification OS 2346100. However the embodi-  
ments known from this specification include dis-  
25 advantages. Thus the spoilers to be attached to the  
yoke or to be inserted in it can only be secured  
thereon in a relatively complicated way and,  
moreover, the connecting points are subject to  
considerable wear and do not look very nice. The  
30 other embodiment known from this specification  
including a spoiler formed out of the wiper element  
might not be stable enough to act against the air  
stream in all cases, because of the rubber-elastic  
materials normally used for the production of wiper  
35 elements. Moreover, as far as technology is concerned,  
the production of such a wiper element  
might be very difficult and therefore expensive.

It is an object of the invention to create a wiper  
blade whose spoiler can be connected with the wiper  
40 element in a simple way and at any time ensures a  
reliable contact between the wiper element and the  
windscreen.

According to the invention there is provided a  
wiper blade for windscreen cleaning installations on  
45 vehicles, especially on motor vehicles, comprising a  
supporting structure including at least one yoke  
element for holding a wiper element of rubber-  
elastic material, which wiper element is flexibly  
stiffened by a flexible strip extending over almost its  
50 entire length, whereby the wiper element is provided  
with at least one spoiler, and wherein the spoiler is  
formed on or attached on the flexible strip.

With such a spoiler arranged the lifting force  
created by the air stream is on the one hand  
55 deflected from the wiper blade and on the other  
hand transmitted to the wiper element via the  
flexible strip as a contact force. Because also the  
contact pressure created by the wiper arm is trans-  
mitted to the wiper element via the supporting  
60 structure, it is hardly possible any more lift the wiper  
element from the pane unintendedly.

When the spoiler and the flexible strip are  
moulded plastics parts a simple and economical  
production is possible, in particular, when the two  
65 parts form one piece. In this case the flexible strip

simultaneously serves to stiffen the wiper blade  
flexibly and is used as a spoiler.

It is easily possible to retrofit a wiper blade by  
squeezing a spoiler against its flexible strip or  
70 clipping it on this flexible strip.

If the flexible strip with its back laps over the head  
of the wiper element and engages thereon by means  
of downwardly directed elongations, it is possible to  
form the back of the flexible strip itself as a spoiler  
75 and/or form a spoiler on it or attach it onto it. In this  
case the flexible strip in addition serves to streng-  
then the head of the wiper element.

The spoiler can be forced onto one of the down-  
wardly directed elongations of the flexible strip. The  
80 elongations can either uninterruptedly extend over  
the entire length of the flexible strip or can be  
formed as individual claws. On grounds of stability  
the first solution is to be preferred.

If at least one projection extending along its back  
85 is formed on the flexible strip, the spoiler can be  
attached to this projection.

It is particularly advantageous, when projections  
are formed on the flexible strip to both sides, which  
projections extend over the entire length of the back  
90 of the flexible strip. On the one hand then spoilers  
can be provided on both sides of the wiper element,  
and on the other hand the wiper element can be  
secured to the supporting structure by means of  
these projections. If desired the projections can be  
95 provided with locking points which serve as stops  
for the supporting structure.

When the spoiler extends over the entire length of  
the wiper element, this results in a uniform contact  
pressure between wiper blade and pane when the  
100 laterally striking air stream is well used.

As far as supporting structures are concerned  
which consist of an interlocking yoke system with  
several clawed yokes carrying the wiper element and  
one main yoke articulated to the clawed yokes, the  
105 contact pressure transmitted to the wiper element  
transmitted from the wiper arm via such a support-  
ing structure is not the same in all places. As is  
known the pressure between the working points of  
the clawed yokes is slightly lower than at the  
110 working points of the clawed yokes on the wiper  
element. It can therefore be reasonable to arrange  
spoilers in these places of the wiper element.

When the spoiler is formed on one of the down-  
wardly directed elongations of the flexible strip and  
the wiper element is secured to the supporting  
structure via the lateral projections of the back of the  
flexible strip it is reasonable to curve in upward  
direction the area below the lateral projection of the  
spoiler and to make the spoiler surface plane. Then  
the supporting structure can be positioned in one  
plane with the spoiler surface on the side exposed to  
the wind, so that the air stream can especially well  
be carried away from the wiper blade. Due to the  
curvature of the spoiler directed towards the back of  
125 the flexible strip the spacing between the supporting  
structure and the spoiler is so small, so that a  
swirling of the air in the gap between supporting  
structure and spoiler is prevented to a far-reaching  
extent.

130 A good effect can also be achieved by a spoiler

which is equipped with a second wiper element arranged in parallel to a first wiper element. By this measure the first wiper element can be completely protected against the air stream appearing.

5 It is of a particular advantage, when the second wiper element is lower than the first wiper element. In this case the second wiper element can be connected with the first wiper element through a spoiler, which is formed in one piece on the flexible strip of the first wiper element and laps over the head of the second wiper element. In this case the flexible strip could be designated as a double or twin flexible strip, because it is connected with two wiper elements.

15 However it would be also conceivable to secure such a spoiler to the flexible strip of the first wiper element by means of holding clips or similar fastening means and is formed in one piece only with the second wiper element.

20 If the spoiler includes moreover a surface ascending relative to the pane to be wiped, which surface is arranged above the head of the second wiper element, it is prevented to a far-reaching extent that the wiper blade can be lifted unintendedly by the air stream, not even at high vehicle speed.

The drawings show diagrammatic sections not true to scale of embodiments according to the invention, in which

30 *Figure 1* is a wiper element including a spoiler which is formed on a flexible strip,

*Figure 2* is a wiper element whose spoiler is formed on both sides of a flexible strip,

*Figure 3* is a wiper element including a flexible strip whose back is formed as a spoiler,

35 *Figure 4* is a wiper element whose spoiler is clipped onto a flexible strip,

*Figure 5* is a wiper element including a double or twin flexible strip and

40 *Figure 6* is a further wiper element including a flexible strip, whose back is formed as a spoiler.

All rubber wiper elements 10 shown in Figures 1 to 5 include a head 11 having a rectangular cross-section which head is equipped with a longitudinal groove 12, 13 each at approximately half of its height. To the head 11 follows a tilting web 14, through which a wiper lip 15 is connected with the head 11. It is provided that, during a wiper operation, the wiper element 10 touches a pane to be cleaned with the downwardly directed tip of the wiper lip 15. The recesses 16, 17 which are necessary for the tilting web 14 and the longitudinal grooves 12, 13 have a rectangular cross-section. On the whole it can be seen from Figures 1 to 5 that the wiper element is developed in a manner known in itself, so that further explanations are not necessary.

To maintain contact pressure in use the wiper elements are equipped with a spoiler 20, which is formed on or attached to a flexible strip 30. Thereby each flexible strip 30 shown in Figures 1 to 6 consists of a moulded plastics part which with its back 31 laps over the head 11 of a rubber wiper element 10. On both sides of the back 31 of the flexible strip 30 an elongation 32, 33 is formed, which is downwardly directed, bent towards the wiper element 10 and which engages into the longitudinal groove 12 and

13 respectively which is arranged in the head 11 of the wiper element 10. It is provided that the flexible strip and the elongations extend over the entire length of the rubber wiper element on grounds of stability.

70 The spoiler 20 shown in Figures 1 to 3 and in Figures 5 to 6 forms an integral part with the flexible strip 30 so that the flexible strip 30 simultaneously strengthens the wiper element 10 and prevents that it is lifted from the pane.

75 The spoiler 20 shown in Figures 1 includes a surface 21 which ascends relative to a pane to be cleaned not shown in the drawing, which surface is formed on the downwardly directed elongation 32 of the flexible strip 30. The back 31 of the flexible strip 30 is laterally elongated beyond the head 11 of the wiper element 10 and forms two projections 34, 35, on which the wiper element 10 may be secured to a supporting structure of which a yoke element is shown here, which embraces the projections 34, 35 by means of its claw-shaped ends 41, 42.

80 The spoiler 20 is thereby substantially formed as a shovel, which below the lateral projection 34 is curved in upward direction towards this projection 34. The plane part of the shovel forms the actual wind deflector surface 21, which extends approximately as far as to half of the height of the wiper lip 15. The surface 21 is approximately positioned in a plane with the outer surface 41a of the claw 41, which during the wiper operation is exposed to the air stream, so that the laterally flowing air stream can be well deflected via the surface 21 and the supporting structure.

85 The wiper element 10 shown in Figure 2 has a spoiler 20 which extends on both sides of its head 11. Thereby the spoiler 20 includes a surface 21 formed on the back 31 of the flexible strip and slightly curved forwards in the direction of the wiper element 10, which surface is to be exposed to the laterally flowing air stream. This air stream exerts a pressure on the spoiler 20 and thus on the flexible strip 30, which transmits the pressure to the wiper element 10 and thus prevents that it is lifted from the pane to be cleaned. As is known part of the air streams beyond the head 11 of the wiper element 10 towards the pane and is swirled there, which could also result in an undesired lifting. In the wiper element 10 shown here this is cured by an upwardly directed wind deflector surface 22 which, in the mounted condition of the wiper blade, points away from the pane. By this measure an air stream appearing behind the wiper element 10 can be deflected.

90 However it would also be conceivable to direct the elongation 22 in the downward direction perpendicularly or at an acute angle and to conduct it as far as possible down the pane, so that the air stream appearing behind the wiper blade is carried away from the wiper element 10.

95 A similar wiper element to that of Figure 2 is shown in Figure 3. Here in addition the back 31 of the flexible strip 30 is developed as a spoiler 20, so that an especially large wind deflector surface 21 is exposed to the air stream. The small amount of air streaming behind the wiper element is also in this

case deflected by an upwardly directed wind deflector surface 22. Because the back 31 of the resilient strip is developed as a hollow member with about triangular cross-section, there is a hollow space between the surfaces 21 and 22 which possibly might be disadvantageous.

This disadvantage is avoided in a wiper element according to Figure 6 in that the head 11 includes an inclined surface 18 which closely rests against the back 31 of a flexible strip 30 and is lapped over by it. The back 31 of the flexible strip is on both sides elongated beyond the inclined surface 18 of the head 11 of the wiper element 10 and forms the wind deflector surface 21. In this case the somewhat smaller, downwardly directed elongation 23 is to be exposed to the air stream. The pressure exerted by the air stream on the back 31 of the flexible strip 30 can especially effectively be transmitted to the head 11 of the wiper element due to the close fit of the parts, so that the tendency of their being lifted is diminished. The air behind the wiper element 10 can be carried away via the elongation 22.

In a comparison to the previously shown rubber wiper elements a further difference of the wiper element according to Figure 6 is to be seen in the fact that the flexible strip 30 engages in the recesses 16 and 17 which are necessary to form the tilting web 15. It is provided that the wiper element 10 is to be secured to a supporting structure at these recesses 16, 17. For this purpose a supporting structure including clawed yokes would be suitable, which preferably extend through recesses longitudinally arranged along the spoiler and which can embrace the head of the wiper element. The longitudinal grooves in the head of the wiper element, which in other cases serve to secure the wiper element, are saved in this version, so that the wiper element can be produced by a press tool of a simpler design. On principle the flexible strips of the previously described figures of the drawing can be secured on the head of the wiper element as described here, however the increased danger of breaking has to be taken into consideration when the tilting web is designed.

The flexible strip 30 including a spoiler 20 shown in Figure 5 is also produced as an integrally moulded plastics part, whereby the spoiler 20 is a solid part. Similar as in the version of Figure 1 the spoiler 20 is formed on a downwardly directed elongation of the flexible strip, however laps over the head 11a of a lower wiper element 10a, which otherwise is constructed identically to the first wiper element 10. The spoiler 20 is formed on the elongation 32 of the flexible strip 30 via a web 27 and includes two elongations 25 and 26 bent in the direction of the second wiper element 10a, which elongations engage in longitudinal grooves 12a and 13a respectively on the head 11a of the wiper element 10. Because the spoiler 20 and the flexible strip 30 form an integral part carrying two wiper elements, this part could be designated as a double or twin flexible strip.

Above the head 11a of the smaller wiper element 10a in this case the spoiler 20 in its cross-section is formed like a double pitch roof with differently large surfaces, whereby its larger surface is arranged

away from the first wiper element 10 and forms the wind deflector surface 21. The tip of the roof ends at the level of the back 31 of the flexible strip 30, so that the air streaming over the spoiler 21 is reliably conducted away from the wiper elements 10a and 10. The back 31 of the flexible strip 30 has two lateral projections 34, 35 via which the entire device can be secured to a supporting structure.

A particular advantage of this version is that due to the combination with an additional rubber wiper element the spoiler extends as far as to the pane to be cleaned. This is not possible in the other versions which show spoilers completely made from plastics material. Because, as is known, the wiper element and with it the spoiler is tilted during the wiper operation, a spoiler extending as far as to the pane could break it or scratch it. Because the end of the spoiler shown in Figure 5 consists of rubber, disadvantages of this kind are not to be feared. When the end is formed as wiper element or wiper lip the pane can be optimally cleaned.

To the wiper element 10 shown in Figure 4 a spoiler 20 is clipped onto a flexible strip, which spoiler has a cross-section similar to a wing. The back 31 of the flexible strip 30 laps over the head 11 of the wiper element 10 constructed in a usual manner. The projection 34, which extends laterally of the back 31 of the flexible strip, has at the top and at the bottom a recess 36 and 37 respectively, into which the spoiler 20 is clipped by means of detents 28 and 29 respectively formed on it.

Also in this case versions are conceivable in which the end of the lateral projection 34 resting against the spoiler 20 extends both over the entire length of the flexible strip and solely over partial sections. The end of the lateral projection 34 resting against the spoiler 20 could, for example, be also formed as a knob. Likewise it would be possible to rivet or screw the spoiler to the flexible strip. The version shown in Figure 4 is only a preferred embodiment of a wiper element including a spoiler attached to the flexible strip.

When choosing the plastics material for integrally produced flexible strips with spoiler it has to be taken care that the plastics material is flexible enough in order to enable an adaption of the rubber wiper element to different pane curvatures, and on the other hand it has enough stiffness not to be deformed by the attacking air stream. For instance polyurethane foam would be a suitable material in the present case of application.

On principle a flexible strip produced from thin metal sheet could also be used, but involves a higher amount of production engineering than a plastics flexible strip which can be injection-moulded.

All embodiments shown in the drawings show a wiper element which includes a spoiler closely arranged to the windscreen and wherein the spoiler is exposed to the air stream which strikes the wiper blade laterally. The spoiler can in all cases be connected with the wiper element in a simple manner. The wiper elements need only to be put into one of the flexible strips which either has been already equipped with a spoiler or onto which it can be additionally attached.

All embodiments shown illustrate a flexible strip which laps over the head of at least one wiper element. However it would also be possible to insert individual flexible strips in the head of the wiper

5 element, which flexible strips either consist of steel as usual or of plastics material, and to equip one of them with a spoiler or form it as a spoiler. In the versions shown due to the uniform load a moment of tilt exerted by the spoiler on the wiper element is effectively overcome. This prevents a premature wear of the wiper lip and ensures a longer service life, which is why this version has to be preferred.

10 Due to the fact that in all cases conventional rubber wiper elements and supporting structure can be used, the invention provides a stable wiper blade with an advantageous flow pattern, which wiper blade can be produced in a simple manner.

#### CLAIMS

20

1. A wiper blade for windscreen cleaning installations on vehicles, especially on motor vehicles, comprising a supporting structure including at least one yoke element for holding a wiper element of rubber-elastic material, which wiper element is flexibly stiffened by a flexible strip extending over almost its entire length, whereby the wiper element is provided with at least one spoiler, and wherein the spoiler is formed on or attached on the flexible strip.

25 2. A wiper blade according to claim 1, wherein the spoiler and the flexible strip are moulded plastics parts.

30 3. A wiper blade according to claim 1 or 2, wherein the spoiler and the flexible strip are formed in one piece.

35 4. A wiper blade according to claim 1 or 2, wherein that the spoiler is squeezed against or clipped onto the flexible strip.

40 5. A wiper blade according to claim 3 or 4, wherein the flexible strip with its back overlaps the head of the wiper element and on both sides is provided with downwardly directed elongations bent towards the wiper element, which elongation engage into longitudinal grooves on the head of the wiper element.

45 6. A wiper blade according to claim 5, wherein the back of the flexible strip is formed as a spoiler.

50 7. A wiper blade according to claim 5 or 6, wherein at least one spoiler is formed or attached on the back of the flexible strip.

8. A wiper blade according to claim 7, wherein the spoiler extends along the head of the wiper element laterally of the back of the flexible strip.

55 9. A wiper blade according to claims 5 and 8, wherein the spoiler is formed on one of the downwardly directed elongations of the flexible strip.

60 10. A wiper blade according to claim 8, wherein on the flexible strip at least one lateral projection is formed which extends along the back of the flexible strip, on which projection at least one spoiler is attached, in particular squeezed against it or clipped onto it.

65 11. Wiper blade according to claim 10, wherein on both sides of the flexible strip a projection is formed which extends over the entire length of the

back of the flexible strip.

12. A wiper blade according to claim 11, wherein the wiper element is secured to the supporting structure through the lateral projections of the flexible strip.

13. A wiper blade according to claim 12, wherein the lateral projections are embraced by the claw-shaped ends of at least one yoke element of the supporting structure.

75 14. A wiper blade according to any one of the preceding claims, wherein the spoiler extends over the entire length of the wiper element.

15. A wiper blade according to any one of claims 1 to 13, wherein the spoiler is arranged only in those places of the wiper element, in which the contact pressure initiated through the supporting structure is low.

16. A wiper blade according to claim 14 or 15, wherein the spoiler includes at least one surface ascending relative to the pane to be cleaned.

17. A wiper blade according to claim 16, wherein the spoiler includes at least one surface which is advanced and curved towards the pane.

18. A wiper blade according to claims 9, 10 and 16, wherein the spoiler is curved upwards in its area below the lateral projection and that to this area follows a plane surface.

19. A wiper blade according to claims 8 and 14, wherein that the spoiler includes a second wiper element, which is arranged in parallel to the first wiper element.

20. A wiper blade according to claim 19, wherein the second wiper element is lower than the first wiper element.

100 21. A wiper blade according to claim 19 or 20, wherein in that the spoiler is formed on one of the downwardly directed elongations of the flexible strip and overlaps the head of the second wiper element.

105 22. A wiper blade according to claim 21, wherein on both sides of the spoiler an elongation is formed which extends over its entire length and is bent towards the second wiper element, which elongation extends into a longitudinal groove on the head of this wiper element.

110 23. A wiper blade according to claim 22, wherein the spoiler includes a surface which is arranged above the head of the second wiper element and ascends relative to the pane to be wiped.

115 24. A wiper blade substantially as described herein with reference to any one of Figures 1 to 6 of the accompanying drawings.

25. A vehicle provided with one or more wiper blades as claimed in any one of the preceding claims.

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